# Does Group Size Impact Weight Loss Outcomes Among Participants in an Adapted Diabetes Prevention Program?

Sarah M. Brokaw, MPH; Diane Arave; Derek N. Emerson, MS;
Marcene K. Butcher, RD, CDE; Steven D. Helgerson, MD, MPH; Todd S. Harwell, MPH
Montana Department of Public Health and Human Services, Helena, MT

## Abstract

**Purpose**

To assess if group size is associated with the weight loss goal among participants in an adapted Diabetes Prevention Program (DPP).

**Methods**

Adults at high-risk (N = 841) for cardiovascular disease (CVD) and type 2 diabetes were enrolled in the DPP in 2011. The median group size was 16 (range 8-38) participants. Multiple logistic regression (LR) analyses were used to determine if group size (smaller group <16 participants or larger group ≥16 participants) was independently associated with the weight loss goal among participants.

**Outcomes**

The mean age of participants was 53.4 years, and 82% were female. The mean number of core sessions attended was 13, and 36% of participants achieved the 7% weight loss goal.

In bivariate analyses, participants in smaller groups were more likely than participants in larger groups to have a higher BMI at baseline, attended fewer intervention sessions, were less likely to self-monitor their fat intake for ≥14 weeks, and lost less weight during the DPP.

However, using multiple LR analyses adjusting for age, sex, baseline BMI, achievement of the physical activity goal, self-monitoring fat intake, and group size, only two factors were independently associated with achievement of the weight loss goal: frequency of self-monitoring fat and achievement of the physical activity goal.

**Conclusions**

Our findings indicate that group size is not associated with achievement of the weight loss goal in an adapted DPP.

## Background

- The prevalence of type 2 diabetes continues to rise in the US. 1 in 3 individuals born in 2000 will develop type 2 diabetes in their lifetime.[1]
- The National Institutes of Health (NIH) and Finnish DPP studies demonstrated that the incidence of type 2 diabetes among adults at high-risk can be significantly reduced through intensive lifestyle intervention.[2,3]
- The landmark clinical trials delivered the DPP one-on-one to participants.[2,3] Translation studies have shown that it is feasible and effective to deliver the DPP in a group setting and achieve similar weight loss outcomes.[4] The Montana DPHHS began implementing an adapted, group-based DPP in 2008 and achieved results very similar those achieved by the NIH DPP.[5,6]
- Several DPP translation studies reported group size: one reported a mean of 4, whereas others have reported ranges of 6-12, 7-16, 8-21, and 8-34.[5,7-13]
- Optimal group size to deliver the DPP or if group size affects participant achievement of the weight loss goal has not been documented.

## Objective

**To assess if group size impacts the weight loss outcomes of participants in the Montana Department of Public Health and Human Services' (DPHHS) adapted, group-based DPP.**

## Methods

### Intervention Sites and Intervention Design

**Sites:** The MT DPHHS implemented the DPP at 14 health care facilities in 2011.
- 12 hospital outpatient DSME programs, 2 collaborated with the Y
- 1 rural health clinic
- 1 local health department

**Lifestyle Coaches:** Trained health professionals (RN, RD, CDE, PT).

**Intervention:** 10-month intensive lifestyle intervention: 16 weekly core sessions followed by 6 monthly after core sessions.

**Curriculum:** NIH DPP *Lifestyle Balance* curriculum. Sessions include healthy eating, physical activity, and problem solving.[6]

**Participant Lifestyle Change Goals:**
- Self-monitoring dietary intake and physical activity
- ↓ fat gram intake
- ↑ moderately intense physical activity to ≥150 min/week
- 7% weight loss

**Recruitment Strategies:** Referring providers, community groups, and employers; paid and earned media, brochures, and word-of-mouth.

**Group Sizes:** Group sizes at each site developed naturally and depended on factors such as number of enrolled participants, attendance, and classroom size.

### Participant Eligibility Criteria

1. Aged 18 years and older
2. Overweight (BMI ≥ 25.0 kg/m$^2$)
3. Plus ≥1 of the following risk factors for CVD and type 2 diabetes:
   a) Diagnosis of prediabetes, IGT or IFG
   b) A1C between 5.7% and 6.4% (added in 2011)
   c) High blood pressure (≥130/85 mmHg or treatment)
   d) Dyslipidemia
      - triglycerides >150 mg/d:
      - LDL-cholesterol >130mg/dl or treatment
      - HDL-cholesterol <40mg/dl for men or <50mg/dl for women
   e) History of GDM or gave birth to a baby >9 lbs

*Exclusion criteria: diagnosed with diabetes, unstable cardiac disease, cancer and currently undergoing treatment, or end-stage renal disease or currently on dialysis; were unable to participate in regular, moderate physical activity; or were pregnant or planning to become pregnant within the next six months.*

### Data Collection

At baseline, 4 months and 10 months: height, weight, BMI, A1C or fasting blood glucose, blood pressure, lipids, and current medication(s). At each session, weight was measured and self-monitoring records were submitted for dietary fat intake (average grams/day) and physical activity (minutes/week).

### Data Analysis

Data were analyzed using SPSS v.15.0 (Chicago, IL).

Group sizes were calculated based on the number of participants that attended the weekly core sessions. The median group size was 16 (range 8 to 38), and participants were categorized into smaller groups (<16) or larger groups (≥16).

Self-monitoring of fat intake was categorized into three groups: 0-6 weeks, 7-13 weeks, and ≥14 weeks. Physical activity level was categorized as met the goal or did not meet the goal/unknown.

Independent *t*-tests and $\chi^2$ tests were used to compare baseline characteristics and outcomes among participants in the smaller vs. larger group. Intention-to-treat analyses were performed using the last observed weight to calculate weight loss. Multiple LR were used to identify variables independently associated with participant achievement of the weight loss goal. Adjusted odds ratios (ORs) and 95% confidence intervals (CI) were calculated.

## Results

### Participant Characteristics, Behaviors, and Weight Loss

There were no statistically significant differences in demographic characteristics or outcome measures between groups except as follows:
- Participants in smaller groups (<16) had a significantly higher BMI at baseline and attended more core sessions than participants in larger groups (≥16).
- Participants in larger groups were significantly more likely to self-monitor their fat intake for a longer period of time (Table 1).

**Table 1. Participant demographic characteristics, attendance, physical activity levels, and self-monitoring of dietary fat intake.**

| | Overall | By Group Size | |
|---|---|---|---|
| | (N = 841) | Smaller (n = 420) | Larger (n = 421) |
| **Demographic Characteristics** | Mean (SD) | Mean (SD) | Mean (SD) |
| **Age (years)** | 53 (12) | 54 (12) | 54 (11) |
| **BMI (kg/m$^2$) at baseline** | | **36.3 (7.3)[a]** | 35.1 (7.0) |
| | % (n) | % (n) | % (n) |
| **Sex (female)** | 82 (688) | 84 (351) | 80 (337) |
| **Outcome Measures** | Mean (SD) | Mean (SD) | Mean (SD) |
| **Attendance (in 16-session core)** | 13.0 (4.4) | **13.8 (3.8)[b]** | 12.5 (4.6) |
| **Physical activity (mean min/wk)** | | 190 (110) | 182 (108) |
| **Self-monitoring fat intake (wks)** | | % (n) | % (n) |
| **0 – 6** | | 43 (181) | 30 (126) |
| **7 – 13** | | 43 (182) | 51 (215) |
| **14+** | | 14 (57) | **19 (80)[c]** |
| **Physical activity goal** | | | |
| **Met** | | 51 (214) | 53 (221) |
| **Unmet/Unknown** | | 49 (206) | 47 (200) |

[a]P = 0.03 (t-test). [b]P ≤ 0.001 (t-test). [c]P = 0.01 ($\chi^2$ test). [d] ≥150 min/week.

There were no statistically significant differences in weight loss, change in BMI, achievement of ≥5% weight loss, or achievement of the 7% weight loss goal between groups (Table 2).

**Table 2. Participant weight loss outcomes by group size.**

| | Group Size | |
|---|---|---|
| | Smaller (n = 420) | Larger (n = 421) |
| **Weight Loss Outcomes** | Mean (SD) | Mean (SD) |
| **Weight loss (kg)** | 5.1 (4.7) | 5.8 (4.5) |
| **Change in BMI (kg/m$^2$)** | 2.4 (1.6) | 2.4 (1.6) |
| | % (n) | % (n) |
| **Achieved ≥5% weight loss** | 48 (202) | 54 (229) |
| **Achieved 7% weight loss goal** | 33 (140) | 39 (166) |

Using multiple LR, group size was not independently associated with achievement of ≥5% weight loss or the 7% weight loss goal (Table 3). Likewise, age, sex, and baseline BMI were not independently associated with achievement of the weight loss outcomes. Only two factors were independently associated with achievement of 5% or 7% weight loss: increased weekly self-monitoring of dietary fat intake and achievement of the physical activity goal (data not shown). [15]

**Table 3. Effect of group size on participant achievement of ≥5% weight loss or the 7% weight loss goal.**

| | ≥5% weight loss | | 7% weight loss goal | |
|---|---|---|---|---|
| **Group size** | AOR (95% CI)* | P | AOR (95% CI) | P |
| **<16** | 0.98 (0.69-1.38) | 0.73 | 1.03 (0.73-1.44) | 0.90 |
| **≥16 (Referent)** | 1.0 | | 1.0 | |

*Adjusted odds ratio (ninety-five percent confidence interval)

## Discussion

### Conclusions

Group size is not independently associated with achievement of ≥5% weight loss or the 7% weight loss goal among participants in the adapted, group-based DPP. DPP weight loss goals can be achieved as effectively with large groups as with small groups. Our findings also suggest that dietary self-monitoring and increased physical activity are important factors that affect weight loss outcomes in the DPP.

### Study Limitations

- Self-monitored dietary fat and physical activity data were used, which introduces self-report bias and recall bias.
- The study did not adjust for additional demographic or psychosocial characteristics (e.g., household income, depression). However, the NIH DPP found that these variables were not independently associated with weight loss outcomes.[16]
- Group-related factors other than size (e.g., group dynamics, group cohesion, susceptibility to social influence) were not assessed.
- Group sizes were categorized according to attendance throughout the core sessions to more reflect the group size experience during the course of the intervention. An alternative method would be to categorize group size by the first core session.
- Group size was categorized by the median in the results shown. Group size categorized by quartile was also included in the multiple LR and none of the quartiles were independently associated with the weight loss outcomes.

### Benefits and Challenges of Group-Based Lifestyle Interventions

Challenges:
- Group facilitation skills are needed
- Sufficient meeting space and other logistics for a group class
- Demands for individualized feedback and support to participants

Benefits:
- Shared learning, feedback, and support from peers
- Increased number of persons that can participate
- Enhanced cost effectiveness of the intervention

### Economic Costs and Cost Effectiveness

An economic analysis of the NIH DPP found that the one-on-one delivered lifestyle intervention cost approximately $1,400 per participant and was cost-effective.[12] Relatively few DPP translation studies have reported the estimated cost to deliver the DPP in a group setting, which ranged from $275 to $500 per participant.[5,10,13] Further research is needed to investigate the economic costs and cost effectiveness of delivering the DPP in a group setting.

## References

1. Narayan KM et al. *JAMA* 2003;290:1884-90.
2. Tuomilehto J et al. *N Engl J Med* 2001;344:1343-50.
3. Knowler WC et al. *N Engl J Med* 2002;346:393-403.
4. Venditti EM, Kramer MK. *Curr Diab* 2012;12:138-46.
5. Amundson HA et al.. *Diabetes Educ* 2009;35:209-23.
6. Vanderwood KK et al. *Diabetes Care* 2010;33:2543-5.
7. Jaber LA et al. *Diabetes Res Clin Pract* 2011;91:307-15.
8. Ackermann RT et al. *Am J Prev Med* 2008;35:357-63.
9. Katula JA et al. *Diabetes Care* 2011;34:1451-7.
10. Kramer MK et al. *Diabetes Educ* 2011;37:659-68.
11. West DS et al. *Diabetes Care* 2012 Dec 28. (Epub)
12. Herman WH et al. *Diabetes Care* 2003;26:36-47.
13. Ackermann RT et al. *Diabetes Educ* 2007;33:69, 74-8.
14. DPP Research Group. *Diabetes Care* 2002;25:2165-71.
15. Harwell TS et al. *Prim Care Diabetes*. 2011;5:125-9.
16. Wing RR et al. *Obes Res* 2004;12:1426-34.

## Montana Cardiovascular Disease & Diabetes Prevention Program

This program was supported by the State of Montana and Cooperative Agreement Numbers 3U58DP001977 from the Centers for Disease Control and Prevention.
Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

Correspondence: Sarah M. Brokaw, MPH · Montana DPHHS, PO Box 202951, Helena, MT 59620-2951 · Phone: (406) 444-9154 · Email: sbrokaw@mt.gov · Website: www.mtprevention.org